



Functional Servicing & Storm Water Management Report

Proposed Buildings at Existing Self-Storage Development 109-121 Willowlea Road, Carp, Ontario

Prepared for



ACCESS PROPERTY DEVELOPMENT
ACCESS GROUP OF COMPANIES

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EXECUTIVE SUMMARY

- The site is presently operating as a self-storage facility, located at 109-121 Willowlea Road, Carp, Ontario. Offices for the property are located in a separate building on the other side of Willowlea Road.

Adjacent properties are industrial developments on all sides of the property.

- The proposal combines the existing property and a presently vacant lot.
- The proposed development is for the construction of two new single story self-storage buildings over a presently vacant portion of the site, beside the existing buildings.
- Storm drainage is to be collected and controlled by an on-site pond facility.
- The existing property presently discharges from the site via a swale and easement to an outlet to Willowlea Road at the west end of the presently vacant lot. Post-development storm runoff from the portion of the site being developed is controlled to pre-development levels or better for all design events from the 2 through 100-year storm and discharging through the same outlet as present.
- Bedrock at the east portion of the site is a shallow 0.6m below existing ground.
- No sanitary drainage is presently provided to the site or planned for the future additional buildings. Services for clients are available in the existing offices across the street.
- Fire protection is provided by an existing 90,000 liter storage tank. The new buildings are to be protected by the addition of another 50,000 liter storage tank adjacent and connected to the existing.

EXISTING CONDITIONS

BACKGROUND AND SITE DESCRIPTION

The site is comprised of two properties: the portion presently operating as a self-storage facility with one storage building and an area of 8652m² and the adjacent vacant property with an area of 7789m². Both properties are owned by the applicant and it is the intent to merge the properties as part of this application.

The proposed facility is serviced by an office located in the main self-storage facility across the street.

A site plan application was previously approved for the construction of two self-storage buildings on the west lot but only one of the two has been constructed to date.

Adjacent properties are commercial and industrial facilities.

TOPOGRAPHY AND DRAINAGE

The combined area of the overall site area is 16,441.2m². The west portion, the current self-storage area, is mostly gravel while the east portion is vegetated. Both parcels drain via a grassed swale at the south property line to an existing culvert installed at the southeast corner of the site as part of the site plan design for the current self-storage facility.

SUB-SURFACE CONDITIONS

A geotechnical investigation for the site was completed by Pinchin Ltd. on May 6th, 2021. Six boreholes were sampled throughout the site to refusal at probable bedrock. Borehole locations, with top and bottom elevations corrected to local benchmark, are indicated on the site servicing and grading drawings.

Site stratigraphy is described in the Pinchin report as “a combination of organics, granular fill and glacial till overlying probable bedrock to the maximum borehole refusal depth of approximately 2.1 mbgs”, with the deepest borehole closest to the existing entrance (BH1 – 2.06m), BH6 near the back of the existing storage facility is 0.91m to bedrock and *all other* boreholes having a maximum depth of 0.61m from existing ground to borehole refusal and assumed bedrock. Also, “surficial organics were encountered in Boreholes BH2 to BH5 and were measured to range in thickness from approximately 100 to 600 mm” and that “groundwater was encountered between approximately 0.2 and 2.0 mbgs within Boreholes BH1, BH2, and BH4; however, was not encountered within the remainder of the boreholes at drilling completion. The water encountered is perched above the relatively impermeable probable rock surface. Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather condition”.

Recommended pavement structure from the Pinchin report is as follows:

Pavement Layer	Compaction	Light Duty Paving	Heavy Duty Paving
Asphalt Layer (OPSS 1150)	92-97% MRD	40mm HL3 50mm HL8	40mm HL3 50mm HL8
OPSS 1010 Granular A	100% SPMDD	150mm	150mm
OPSS 1010 Granular B Sub-Base, Type II	100% SPMDD	300mm	450mm

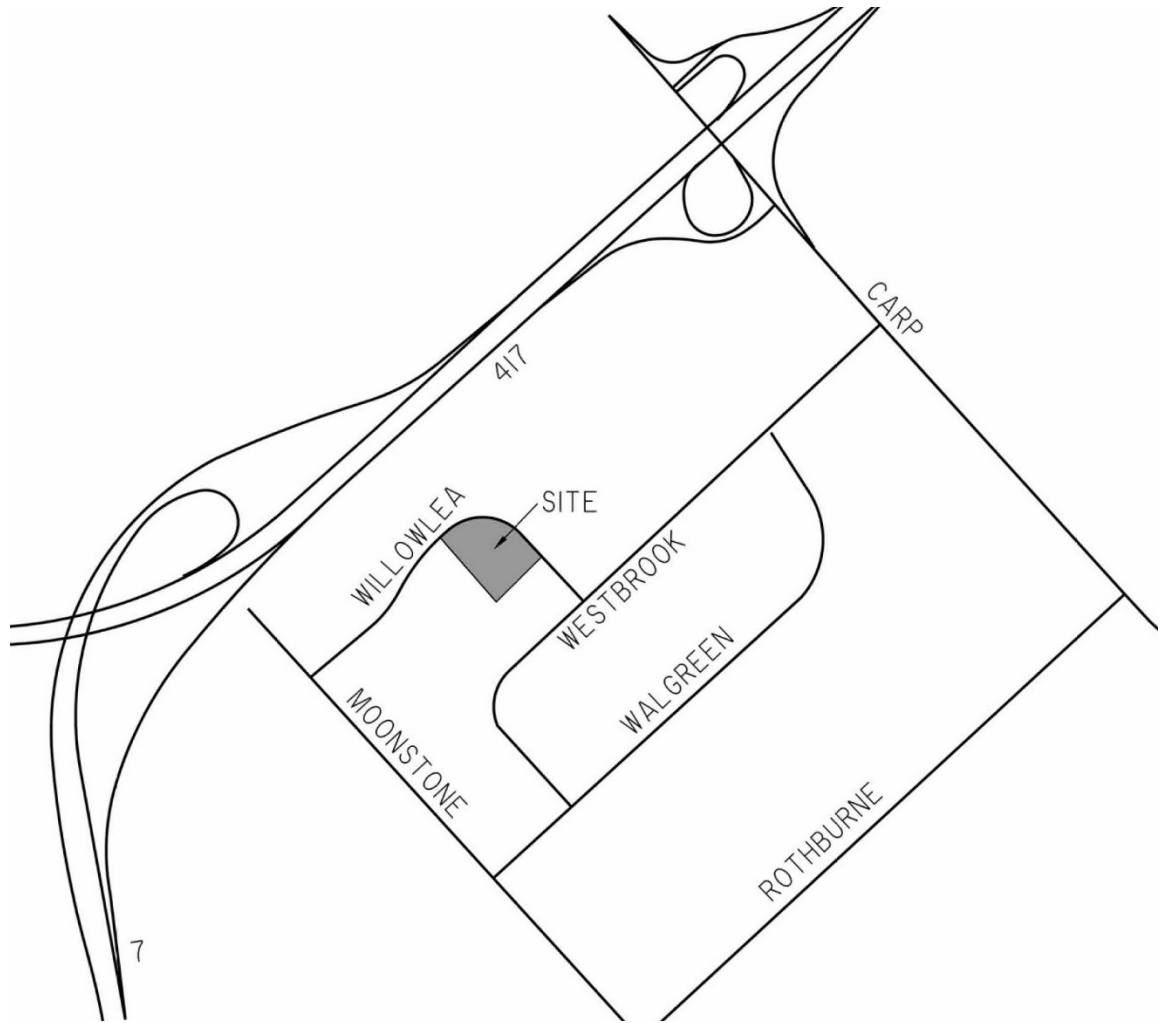


Figure 1: Site Location

PROPOSED DEVELOPMENT

The proposed development is for the construction of two single-story self-storage buildings adjacent to the existing self-storage building.

SERVICING AND DRAINAGE

STORM FLOWS

As noted previously, flows from the site are overland to the southeast corner of the property. Because of the shallow bedrock, the proposal maintains overland drainage in lieu of storm sewers and catchbasins. Site discharge is to the current point, via the existing culvert at the outlet to the existing ditch at the side of Willowlea Road.

STORM WATER MANAGEMENT

Paved and other impervious areas (such as building roofs, sidewalks, etc.) which no longer allow absorption by native soils of storm water runoff from a development site are the primary factor affecting the quantity and rate of storm runoff from the site after development. To mitigate this, a pond is proposed for the southeast corner of the property to control storm quantity to predevelopment levels for storm events from the 2- to 100-year events.

Existing Drainage Area and Runoff Coefficients

The existing site is 41% impervious and has a runoff coefficient C of 0.516.

Existing Conditions

Existing Buildings	1040.5	
Paved Area	<u>5736.6</u>	m ²
<i>Total Impervious Area:</i>	<i>6777.1</i>	<i>m²</i>
Landscaped Area:	<u>9664.1</u>	m ²
Total:	16441.2	m²

			% of Area	Runoff Coefficient	Weighted Coefficient
Impervious	6777.1	sq.m.	41.22%	0.90	0.371
Landscaped	<u>9664.1</u>	sq.m.	<u>58.78%</u>	0.25	<u>0.147</u>
Total	16441.2	sq.m.	100.00%		0.518

Note: notwithstanding the above existing condition, a pre-development (vacant land) runoff coefficient of C=0.20 was used to determine allowable runoff and storage volumes required.

Proposed Drainage Area and Runoff Coefficient

Proposed Development

Buildings:	4913.0	sq.m.
Paved Area	<u>7355.9</u>	sq.m.
Total Impervious Area:	12268.8	sq.m.
Landscaped Area:	<u>4172.4</u>	sq.m.
	16441.2	sq.m.

Since the proposed buildings drain directly to the surrounding surfaces, the building roof area was considered as part of the paved area. The resultant runoff coefficient for the area being developed is as follows:

Proposed:		% of Area	Runoff Coefficient	Weighted Coefficient
Paved and Roof	12268.9 sq.m.	74.62%	0.90	0.672
Landscaped	<u>4172.3</u> sq.m.	<u>25.38%</u>	0.25	<u>0.063</u>
Total	16441.2 sq.m.	100.00%		0.735

The above runoff coefficient was adjusted for low frequency events in accordance with MTO guidelines as follows:

Storm Return Period	Adjustment Factor	Adjusted Coefficient
2	1	0.815
5	1	0.815
10	1	0.815
25	1.1	0.896
50	1.2	0.978
100	1.25	1.000

Outflows were controlled with a 250mm orifice pipe. Summarizing the results:

Peak Flows:

Storm Event	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
Q achieved (m3/s)	0.0335	0.0456	0.0522	0.0639	0.0725	0.0788
Q allowable (m3/s)	0.0633	0.0841	0.0841	0.0841	0.0841	0.0841
Δ achieved vs allowable	-0.0298	-0.0385	-0.0319	-0.0202	-0.0115	-0.0053

Storage:

Storm Event	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
Storage Required:	133.91	175.98	206.25	274.51	342.18	400.94
Storage Provided:	134.20	176.91	206.56	276.54	343.25	401.44
Δ achieved vs allowable (m3):	0.28	0.93	0.31	2.03	1.07	0.50
Water Surface Elevation:	128.99	129.05	129.09	129.17	129.23	129.29

The required pre- to post- development flow and storage criteria are met.

Refer to Appendix A for the supporting calculations.

OVERLAND FLOW ROUTING

In the event of clogging or an exceptional storm event, flows in excess of the capacity of the proposed system are conveyed via an overflow spillway at the south side of the pond to the existing outlet on Willowlea Road, in the same manner and to the same location as surface runoff would be in the current pre-development condition.

WATER QUALITY

Although the proposed use is not a generator of heavy sediment loading and the site is 30% roof areas, the entire area was considered.

Based on a post-development impervious ratio of 74.6%, per the MOE SWM Planning and Design Manual, 80% long term removal of Total Suspended Solids (TSS) can be achieved with 36.5m³ of storage per hectare, or 60m³ for the site. By providing a nominally raised outlet invert and a 325m² bed of 50mm clear stone, 300mm thick over the pond bottom, a total storage volume of 62.9m³ is provided.

WATER BALANCE

Although with the existing ground water in the area of the pond near the surface (i.e.: well less than the required minimum 1.0m depth to ground water) infiltration is not ideal, with an outlet invert above the pond invert the proposed gravel sediment basin from the preceding section will act as an area of enhanced evapotranspiration and somewhat limited or delayed infiltration essentially acting as a stormwater wetland. We respectfully submit that the proposed meets or exceeds the natural groundwater recharge capabilities of the site.

SANITARY SERVICING

No sanitary servicing is proposed. Facilities are available for patrons and staff in the existing site offices across the road.

POTABLE AND FIRE WATER SUPPLY

No potable water supply is proposed.

There is an existing 90,000 liter storage system for fire suppression. Based on OBC requirements and buildings from Group F, Division 2 (from architects for the project, Architecture49), and a K value of 17, the required storage is 140291 liters. An additional 50,000 liters of storage will be provided by adding additional storage volume (detailed design by others).

EROSION AND SEDIMENT CONTROL

DURING CONSTRUCTION

Erosion and sediment control measures are to be implemented prior to the start of construction and maintained for the duration of the works.

Since the effectiveness of erosion and sediment controls decreases with sediment loading, regular inspection and repair of damaged controls is essential. As indicated on the drawing under Siltation and Erosion Control, the following control measures or better are to be implemented:

- Silt Fences are to be installed adjacent to all property limits subject to drainage from the development area prior to topsoil stripping and in other locations, such as the base of any topsoil stockpiles.
- Discharge from point source discharges (such as dewatering pumps) to be filtered through a rock check dam (OPSD 219.210 or 219.211) and/or silt fence, as appropriate.
- A mud mat is to be provided at the entrance to ensure that mud is not tracked onto adjacent municipal roads. In the event that mud is tracked onto the adjacent roads, it is to be cleaned daily. In the event that the mud mat is deemed not sufficiently effective, truck washing may be required.
- All disturbed areas and stockpiles are to be seeded and stabilized if they are to remain disturbed for thirty days or longer (see drawing notes).
- Care must be taken when removing silt and siltation controls (particularly at catchbasins) to ensure that any accumulated sediment is not dispersed into the storm sewer network.
- Inspections of all of the erosion and sediment controls on the construction site should be undertaken
 - On a weekly basis
 - After every rainfall event
 - After significant snow melt events
 - Prior to forecasted rainfall events

If damaged control measures are identified during inspection, the damaged or ineffective portion should be repaired and/or replaced within 48 hours.

CONCLUSION

The impact of the proposed development on the total runoff from the area of the site being developed is mitigated to pre-development levels or better.

Fire protection is being provided for the proposed development. Domestic water and sanitary services are not existing or required.

The proposed development is consistent with the existing and adjacent developments and can be constructed in accordance with City of Ottawa criteria.

Respectfully submitted,

EC²E: Ediesse Consulting Civil Engineers Ltd.



per: *Marco Savoldelli* P.Eng.

APPENDIX A: QUANTITY CONTROL CALCULATIONS

Runoff was calculated using MTO IDF curves for the site.

$$i=A(t)^B \quad (t \text{ in hours})$$

Parameter	2	5	10	25	50	100
A	19.8	26.3	30.6	36.1	40.1	44.1
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

As stated in report, flows for all storms were controlled to the pre-development runoff from the site based on a runoff coefficient of 0.50.

RESULTS SUMMARY:

Orifice Summary:

Storm	2	5	10	25	50	100
Water Level	128.99	129.05	129.09	129.17	129.23	129.29
C.L. Orifice El.	128.93	128.93	128.93	128.93	128.93	128.93
H (m)	0.07	0.12	0.16	0.24	0.31	0.36
Orifice Diameter (mm)	250	250	250	250	250	250
Radius (mm)	125.0	125.0	125.0	125.0	125.0	125.0
A (sq.m.)	0.0491	0.0491	0.0491	0.0491	0.0491	0.0491
C	0.6	0.6	0.6	0.6	0.6	0.6
Q (c.m./s)	0.0335	0.0456	0.0522	0.0639	0.0725	0.0788
Q allowable (c.m./s.)	0.0633	0.0841	0.0841	0.0841	0.0841	0.0841
Δ , m ³ /s (-ve=less than allowable)	-0.0298	-0.0385	-0.0319	-0.0202	-0.0115	-0.0053
Storage Required:	133.91	175.98	206.25	274.51	342.18	400.94
Storage Provided:	134.20	176.91	206.56	276.54	343.25	401.44
Δ , m ³ (+ve=surplus)	-0.2864	-0.9327	-0.3095	-2.0295	-1.0663	-0.5044

With orifice size calculated using $Q = CA^2\sqrt{2gH}$ and $A = \frac{Q}{C^2\sqrt{2gH}}$

STORM CALCULATIONS:



Runoff:

i) Pre-Development

(Roof areas included in paved areas, except Proposed Building)

Storm: **2 yr.**
 Area = 1.644116 Ha.
 i = 69.3 mm/hr (tc=10 min.)
 C = 0.20
 Q = 0.0633 c.m./s.

ii) Post-Development

(Roof areas included in paved areas, except Proposed Building)

Controlled Area:	% of Area	Weighted Percent	Runoff Coeff.	Weighted Coeff.
Paved 12268.9 sq.m.	74.62%	74.62%	0.90	0.6716
Landscaped 4172.3 sq.m.	25.38%	25.38%	0.25	0.0634
Subtotal 16441.2 sq.m.				
Roof 0.0 sq.m.	0.00%	n/a	n/a	n/a
Total 16441.2 sq.m.	100.00%	100.00%		0.7350
			Frequency Adjustment Factor:	100.00%
			Adjusted Coefficient:	0.7350

iii) Runoff volumes:

Storm: **2 Yr**
 Area: 16441.16 sq.m.
 1.6441 Ha
 C: 0.7350

Max. Outflow Allowed: 63.28 l./s.
 or: 0.0633 c.m./s

Ottawa IDF					Allowable		Using Pipe Orifice	
Time (min)	Intensity (mm/hr)	Inflow Site (c.m./s)	Inflow Roof (c.m./s)	Total Inflow	Predevel. Allowed (c.m./s)	Storage Volume (c.m.)	Outflow Orifice (c.m./s)	Storage Volume (c.m.)
10	69.278	0.2326	0.0000	0.2326	0.0633	101.57	0.0335	119.43
11	64.813	0.2176	0.0000	0.2176	0.0633	101.83	0.0335	121.48
12	60.988	0.2047	0.0000	0.2047	0.0633	101.85	0.0335	123.28
13	57.670	0.1936	0.0000	0.1936	0.0633	101.65	0.0335	124.87
14	54.758	0.1838	0.0000	0.1838	0.0633	101.26	0.0335	126.26
15	52.180	0.1752	0.0000	0.1752	0.0633	100.70	0.0335	127.49
20	42.675	0.1433	0.0000	0.1433	0.0633	95.98	0.0335	131.70
25	36.512	0.1226	0.0000	0.1226	0.0633	88.94	0.0335	133.59
30	32.143	0.1079	0.0000	0.1079	0.0633	80.32	0.0335	133.91
35	28.860	0.0969	0.0000	0.0969	0.0633	70.56	0.0335	133.08
40	26.288	0.0882	0.0000	0.0882	0.0633	59.92	0.0335	131.37
45	24.210	0.0813	0.0000	0.0813	0.0633	48.58	0.0335	128.96
50	22.491	0.0755	0.0000	0.0755	0.0633	36.67	0.0335	125.98
55	21.042	0.0706	0.0000	0.0706	0.0633	24.28	0.0335	122.52
60	19.800	0.0665	0.0000	0.0665	0.0633	11.48	0.0335	118.65
65	18.723	0.0629	0.0000	0.0629	0.0629	0.00	0.0335	114.44
70	17.777	0.0597	0.0000	0.0597	0.0597	0.00	0.0335	109.91
75	16.940	0.0569	0.0000	0.0569	0.0569	0.00	0.0335	105.12
80	16.193	0.0544	0.0000	0.0544	0.0544	0.00	0.0335	100.09
85	15.521	0.0521	0.0000	0.0521	0.0521	0.00	0.0335	94.84

Max. Vol. (cu.m.): 101.85 133.91



Runoff:

i) Pre-Development

Storm: **5 yr.**
Area = 1.644116 Ha.
i = 92.0 mm/hr (tc=10 min.)
C = 0.20
Q = 0.0841 c.m./s.

ii) Post-Development

(Roof areas included in paved areas, except Proposed Building)

Controlled Area:	% of Area	Weighted Percent	Runoff Coeff.	Weighted Coeff.
Paved 12268.9 sq.m.	74.62%	74.62%	0.90	0.6716
Landscaped 4172.3 sq.m.	25.38%	25.38%	0.25	0.0634
Subtotal 16441.2 sq.m.				
Roof 0.0 sq.m.	0.00%	n/a	n/a	n/a
Total 16441.2 sq.m.	100.00%	100.00%		0.7350
			Frequency Adjustment Factor:	100.00%
			Adjusted Coefficient:	0.7350

iii) Runoff volumes:

Storm: **5 Yr**
Area: 16441.16 sq.m.
1.6441 Ha
C: 0.7350

Max. Outflow Allowed: 84.05 l./s.
or: 0.0841 c.m./s

Ottawa IDF					Allowable		Using Pipe Orifice	
Time (min)	Intensity (mm/hr)	Inflow Site (c.m./s)	Inflow Roof (c.m./s)	Total Inflow	Predevel. Allowed (c.m./s)	Storage Volume (c.m.)	Outflow Orifice (c.m./s)	Storage Volume (c.m.)
10	92.020	0.3089	0.0000	0.3089	0.0841	134.91	0.0456	158.01
11	86.089	0.2890	0.0000	0.2890	0.0841	135.27	0.0456	160.67
12	81.009	0.2719	0.0000	0.2719	0.0841	135.28	0.0456	163.00
13	76.601	0.2571	0.0000	0.2571	0.0841	135.02	0.0456	165.04
14	72.734	0.2442	0.0000	0.2442	0.0841	134.50	0.0456	166.83
15	69.310	0.2327	0.0000	0.2327	0.0841	133.76	0.0456	168.40
20	56.684	0.1903	0.0000	0.1903	0.0841	127.48	0.0456	173.68
25	48.498	0.1628	0.0000	0.1628	0.0841	118.13	0.0456	175.87
30	42.695	0.1433	0.0000	0.1433	0.0841	106.69	0.0456	175.98
35	38.334	0.1287	0.0000	0.1287	0.0841	93.73	0.0456	174.57
40	34.918	0.1172	0.0000	0.1172	0.0841	79.60	0.0456	171.98
45	32.158	0.1080	0.0000	0.1080	0.0841	64.53	0.0456	168.47
50	29.875	0.1003	0.0000	0.1003	0.0841	48.71	0.0456	164.19
55	27.949	0.0938	0.0000	0.0938	0.0841	32.25	0.0456	159.28
60	26.300	0.0883	0.0000	0.0883	0.0841	15.25	0.0456	153.83
65	24.869	0.0835	0.0000	0.0835	0.0835	0.00	0.0456	147.91
70	23.613	0.0793	0.0000	0.0793	0.0793	0.00	0.0456	141.59
75	22.502	0.0755	0.0000	0.0755	0.0755	0.00	0.0456	134.91
80	21.509	0.0722	0.0000	0.0722	0.0722	0.00	0.0456	127.91
85	20.617	0.0692	0.0000	0.0692	0.0692	0.00	0.0456	120.62

Max. Vol. (cu.m.):	135.28	175.98
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Runoff:

i) Pre-Development

Storm: **5 yr.**
Area = 1.644116 Ha.
i = 92.0 mm/hr (tc=10 min.)
C = 0.20
Q = 0.0841 c.m./s.

ii) Post-Development

(Roof areas included in paved areas, except Proposed Building)

Controlled Area:	% of Area	Weighted Percent	Runoff Coeff.	Weighted Coeff.
Paved 12268.9 sq.m.	74.62%	74.62%	0.90	0.6716
Landscaped 4172.3 sq.m.	25.38%	25.38%	0.25	0.0634
Subtotal 16441.2 sq.m.				
Roof 0.0 sq.m.	0.00%	n/a	n/a	n/a
Total 16441.2 sq.m.	100.00%	100.00%		0.7350
			Frequency Adjustment Factor:	100.00%
			Adjusted Coefficient:	0.7350

iii) Runoff volumes:

Storm: **10 Yr**
Area: 16441.16 sq.m.
1.6441 Ha
C: 0.7350

Max. Outflow Allowed: 84.05 l./s.
or: 0.0841 c.m./s

Ottawa IDF					Allowable		Using Pipe Orifice	
Time (min)	Intensity (mm/hr)	Inflow Site (c.m./s)	Inflow Roof (c.m./s)	Total Inflow	Predevel. Allowed (c.m./s)	Storage Volume (c.m.)	Outflow Orifice (c.m./s)	Storage Volume (c.m.)
10	107.065	0.3594	0.0000	0.3594	0.0841	165.22	0.0522	184.34
11	100.165	0.3362	0.0000	0.3362	0.0841	166.45	0.0522	187.49
12	94.254	0.3164	0.0000	0.3164	0.0841	167.30	0.0522	190.25
13	89.126	0.2992	0.0000	0.2992	0.0841	167.81	0.0522	192.67
14	84.626	0.2841	0.0000	0.2841	0.0841	168.03	0.0522	194.81
15	80.642	0.2707	0.0000	0.2707	0.0841	167.99	0.0522	196.69
20	65.952	0.2214	0.0000	0.2214	0.0841	164.82	0.0522	203.07
25	56.427	0.1894	0.0000	0.1894	0.0841	158.06	0.0522	205.88
30	49.675	0.1668	0.0000	0.1668	0.0841	148.87	0.0522	206.25
35	44.601	0.1497	0.0000	0.1497	0.0841	137.91	0.0522	204.86
40	40.626	0.1364	0.0000	0.1364	0.0841	125.59	0.0522	202.10
45	37.416	0.1256	0.0000	0.1256	0.0841	112.19	0.0522	198.26
50	34.759	0.1167	0.0000	0.1167	0.0841	97.90	0.0522	193.54
55	32.519	0.1092	0.0000	0.1092	0.0841	82.87	0.0522	188.07
60	30.600	0.1027	0.0000	0.1027	0.0841	67.22	0.0522	181.98
65	28.935	0.0971	0.0000	0.0971	0.0841	51.02	0.0522	175.35
70	27.474	0.0922	0.0000	0.0922	0.0841	34.35	0.0522	168.24
75	26.181	0.0879	0.0000	0.0879	0.0841	17.26	0.0522	160.72
80	25.026	0.0840	0.0000	0.0840	0.0840	0.00	0.0522	152.82
85	23.988	0.0805	0.0000	0.0805	0.0805	0.00	0.0522	144.60

Max. Vol. (cu.m.):	168.03	206.25
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Runoff:

i) Pre-Development

Storm: **5 yr.**
Area = 1.644116 Ha.
i = 92.0 mm/hr (tc=10 min.)
C = 0.20
Q = 0.0841 c.m./s.

ii) Post-Development

(Roof areas included in paved areas, except Proposed Building)

Controlled Area:	% of Area	Weighted Percent	Runoff Coeff.	Weighted Coeff.
Paved 12268.9 sq.m.	74.62%	74.62%	0.90	0.6716
Landscaped 4172.3 sq.m.	25.38%	25.38%	0.25	0.0634
Subtotal 16441.2 sq.m.				
Roof 0.0 sq.m.	0.00%	n/a	n/a	n/a
Total 16441.2 sq.m.	100.00%	100.00%		0.7350
			Frequency Adjustment Factor:	110.00%
			Adjusted Coefficient:	0.8086

iii) Runoff volumes:

Storm: **25 Yr**
Area: 16441.16 sq.m.
1.6441 Ha
C: 0.8086

Max. Outflow Allowed: 84.05 l./s.
or: 0.0841 c.m./s

Ottawa IDF					Allowable		Using Pipe Orifice	
Time (min)	Intensity (mm/hr)	Inflow Site (c.m./s)	Inflow Roof (c.m./s)	Total Inflow	Predevel. Allowed (c.m./s)	Storage Volume (c.m.)	Outflow Orifice (c.m./s)	Storage Volume (c.m.)
10	126.309	0.4664	0.0000	0.4664	0.0841	229.42	0.0639	241.51
11	118.168	0.4364	0.0000	0.4364	0.0841	232.52	0.0639	245.82
12	111.196	0.4106	0.0000	0.4106	0.0841	235.12	0.0639	249.63
13	105.145	0.3883	0.0000	0.3883	0.0841	237.29	0.0639	253.01
14	99.837	0.3687	0.0000	0.3687	0.0841	239.07	0.0639	256.00
15	95.136	0.3513	0.0000	0.3513	0.0841	240.53	0.0639	258.67
20	77.806	0.2873	0.0000	0.2873	0.0841	243.91	0.0639	268.10
25	66.569	0.2458	0.0000	0.2458	0.0841	242.65	0.0639	272.88
30	58.604	0.2164	0.0000	0.2164	0.0841	238.24	0.0639	274.51
35	52.618	0.1943	0.0000	0.1943	0.0841	231.52	0.0639	273.84
40	47.929	0.1770	0.0000	0.1770	0.0841	223.04	0.0639	271.41
45	44.141	0.1630	0.0000	0.1630	0.0841	213.15	0.0639	267.57
50	41.007	0.1514	0.0000	0.1514	0.0841	202.12	0.0639	262.58
55	38.364	0.1417	0.0000	0.1417	0.0841	190.12	0.0639	256.63
60	36.100	0.1333	0.0000	0.1333	0.0841	177.31	0.0639	249.86
65	34.136	0.1261	0.0000	0.1261	0.0841	163.80	0.0639	242.40
70	32.412	0.1197	0.0000	0.1197	0.0841	149.67	0.0639	234.32
75	30.886	0.1141	0.0000	0.1141	0.0841	135.01	0.0639	225.70
80	29.524	0.1090	0.0000	0.1090	0.0841	119.86	0.0639	216.59
85	28.299	0.1045	0.0000	0.1045	0.0841	104.28	0.0639	207.06

Max. Vol. (cu.m.):	243.91	274.51
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Runoff:

i) Pre-Development

Storm: **5 yr.**
Area = 1.644116 Ha.
i = 92.0 mm/hr (tc=10 min.)
C = 0.20
Q = 0.0841 c.m./s.

ii) Post-Development

(Roof areas included in paved areas, except Proposed Building)

Controlled Area:	% of Area	Weighted Percent	Runoff Coeff.	Weighted Coeff.
Paved 12268.9 sq.m.	74.62%	74.62%	0.90	0.6716
Landscaped 4172.3 sq.m.	25.38%	25.38%	0.25	0.0634
Subtotal 16441.2 sq.m.				
Roof 0.0 sq.m.	0.00%	n/a	n/a	n/a
Total 16441.2 sq.m.	100.00%	100.00%		0.7350
			Frequency Adjustment Factor:	120.00%
			Adjusted Coefficient:	0.8821

iii) Runoff volumes:

Storm: **50 Yr**
Area: 16441.16 sq.m.
1.6441 Ha
C: 0.8821

Max. Outflow Allowed: 84.05 l./s.
or: 0.0841 c.m./s

Ottawa IDF					Allowable		Using Pipe Orifice	
Time (min)	Intensity (mm/hr)	Inflow Site (c.m./s)	Inflow Roof (c.m./s)	Total Inflow	Predevel. Allowed (c.m./s)	Storage Volume (c.m.)	Outflow Orifice (c.m./s)	Storage Volume (c.m.)
10	140.305	0.5652	0.0000	0.5652	0.0841	288.69	0.0725	295.62
11	131.262	0.5288	0.0000	0.5288	0.0841	293.51	0.0725	301.13
12	123.516	0.4976	0.0000	0.4976	0.0841	297.73	0.0725	306.05
13	116.795	0.4705	0.0000	0.4705	0.0841	301.42	0.0725	310.43
14	110.899	0.4467	0.0000	0.4467	0.0841	304.66	0.0725	314.36
15	105.678	0.4257	0.0000	0.4257	0.0841	307.49	0.0725	317.88
20	86.428	0.3482	0.0000	0.3482	0.0841	316.93	0.0725	330.79
25	73.946	0.2979	0.0000	0.2979	0.0841	320.74	0.0725	338.06
30	65.098	0.2622	0.0000	0.2622	0.0841	320.73	0.0725	341.52
35	58.448	0.2354	0.0000	0.2354	0.0841	317.93	0.0725	342.18
40	53.239	0.2145	0.0000	0.2145	0.0841	313.00	0.0725	340.71
45	49.032	0.1975	0.0000	0.1975	0.0841	306.36	0.0725	337.53
50	45.550	0.1835	0.0000	0.1835	0.0841	298.33	0.0725	332.97
55	42.615	0.1717	0.0000	0.1717	0.0841	289.13	0.0725	327.24
60	40.100	0.1615	0.0000	0.1615	0.0841	278.95	0.0725	320.52
65	37.918	0.1527	0.0000	0.1527	0.0841	267.91	0.0725	312.95
70	36.004	0.1450	0.0000	0.1450	0.0841	256.14	0.0725	304.63
75	34.309	0.1382	0.0000	0.1382	0.0841	243.70	0.0725	295.67
80	32.795	0.1321	0.0000	0.1321	0.0841	230.69	0.0725	286.11
85	31.435	0.1266	0.0000	0.1266	0.0841	217.15	0.0725	276.04

Max. Vol. (cu.m.):	320.74	342.18
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Runoff:

i) Pre-Development

Storm: **5 yr.**
Area = 1.644116 Ha.
i = 92.0 mm/hr (tc=10 min.)
C = 0.20
Q = 0.0841 c.m./s.

ii) Post-Development

(Roof areas included in paved areas, except Proposed Building)

Controlled Area:	% of Area	Weighted Percent	Runoff Coeff.	Weighted Coeff.
Paved 12268.9 sq.m.	74.62%	74.62%	0.90	0.6716
Landscaped 4172.3 sq.m.	25.38%	25.38%	0.25	0.0634
Subtotal 16441.2 sq.m.				
Roof 0.0 sq.m.	0.00%	n/a	n/a	n/a
Total 16441.2 sq.m.	100.00%	100.00%		0.7350
			Frequency Adjustment Factor:	125.00%
			Adjusted Coefficient:	0.9188

iii) Runoff volumes:

Storm: 100 Yr
Area: 16441.16 sq.m.
1.6441 Ha
C: 0.9188

Max. Outflow Allowed: 84.05 l./s.
or: 0.0841 c.m./s

Ottawa IDF					Allowable		Using Pipe Orifice	
Time (min)	Intensity (mm/hr)	Inflow Site (c.m./s)	Inflow Roof (c.m./s)	Total Inflow	Predevel. Allowed (c.m./s)	Storage Volume (c.m.)	Outflow Orifice (c.m./s)	Storage Volume (c.m.)
10	154.300	0.6475	0.0000	0.6475	0.0841	338.05	0.0788	341.20
11	144.355	0.6057	0.0000	0.6057	0.0841	344.32	0.0788	347.78
12	135.837	0.5700	0.0000	0.5700	0.0841	349.88	0.0788	353.66
13	128.446	0.5390	0.0000	0.5390	0.0841	354.85	0.0788	358.94
14	121.962	0.5118	0.0000	0.5118	0.0841	359.29	0.0788	363.70
15	116.219	0.4877	0.0000	0.4877	0.0841	363.27	0.0788	367.99
20	95.049	0.3988	0.0000	0.3988	0.0841	377.75	0.0788	384.05
25	81.322	0.3412	0.0000	0.3412	0.0841	385.79	0.0788	393.66
30	71.591	0.3004	0.0000	0.3004	0.0841	389.45	0.0788	398.90
35	64.278	0.2697	0.0000	0.2697	0.0841	389.91	0.0788	400.94
40	58.550	0.2457	0.0000	0.2457	0.0841	387.93	0.0788	400.53
45	53.923	0.2263	0.0000	0.2263	0.0841	383.99	0.0788	398.17
50	50.094	0.2102	0.0000	0.2102	0.0841	378.46	0.0788	394.21
55	46.865	0.1967	0.0000	0.1967	0.0841	371.60	0.0788	388.93
60	44.100	0.1851	0.0000	0.1851	0.0841	363.60	0.0788	382.51
65	41.700	0.1750	0.0000	0.1750	0.0841	354.63	0.0788	375.11
70	39.595	0.1661	0.0000	0.1661	0.0841	344.81	0.0788	366.87
75	37.731	0.1583	0.0000	0.1583	0.0841	334.24	0.0788	357.87
80	36.067	0.1513	0.0000	0.1513	0.0841	323.00	0.0788	348.20
85	34.570	0.1451	0.0000	0.1451	0.0841	311.16	0.0788	337.94

Max. Vol. (cu.m.): 389.91 400.94

STORAGE CALCULATIONS:

Pond Elevation	Area (m ²)	Depth (m)	Δ Vol (m ³)	Storage (m ³)
128.630	0.00			0.00
128.700	63.23	0.070	2.21	2.21
128.800	370.12	0.100	21.67	23.88
128.900	613.61	0.100	49.19	73.07
129.000	729.87	0.100	67.17	140.24
129.100	830.66	0.100	78.03	218.27
129.200	962.35	0.100	89.65	307.92
129.300	1,115.97	0.100	103.92	411.83
129.400	1,357.60	0.100	123.68	535.51
129.430	1,433.60	0.030	35.94	571.45

For TSS removal:

From MOE Table 3.2, for 80% long term TSS removal by infiltration:

- for 70% impervious, require 35m³ per hectare
- for 85% impervious, require 40m³ per hectare

Therefore, for site (74.6% impervious and 1.644Ha), require **60.08m³** of storage.

Provided:

- Surface storage below outlet elevation of 128.80, from above: 21.67m³
- From 325m² of clear stone, 0.30m deep, and based on a 40% void ratio, 325*0.3*0.4: 39.00m³
- Total provided: 62.88m³

APPENDIX B: FIRE FLOW CALCULATIONS

	Building A		Building B		Building C	
Floor Area:	1040.47	sq.m.	2462.8	sq.m.	1409.7	sq.m.
Height Walls:	3.05	m	3.05	m	3.05	m
Building Width:	12.21	m	28.88	m	24.4	m
Height Roof (1:24):	0.25	m	0.60	m	0.51	m
Building Volume V:	3305.8	m3	8252.4	m3	4657.9	m3

$$Q = KVS_{tot}$$

Building classification, from Architecture49:

Non-combustible construction per 3.2.2 (*)

Group F Division 2 K: 17

	Factor	Distance	Factor	Distance	Factor	Distance
S North	0		0		0	
S South	0		0		0	
S East	0	(13m)	0	(10.2m)	0	
S West	0		0	(13m)	0	(10.2m)
S_{tot}	1		1		1	

Water Supply Volume Req'd, Q:	56,198.06	liters	140,291.35	liters	79,184.02	liters
Or:	56.20	m3	140.29	m3	79.18	m3
<i>Minimum Supply Rate</i>	2700	L/min	4500	L/min	2700	L/min
Minimum 30 Minute Supply Volume	81,000.00	liters	135,000.00	liters	81,000.00	liters
Minimum 30 Minute Supply Volume	81.00	m3	135.00	m3	81.00	m3

Water supply required is greater of Volume Required or Minimum 30 minute supply

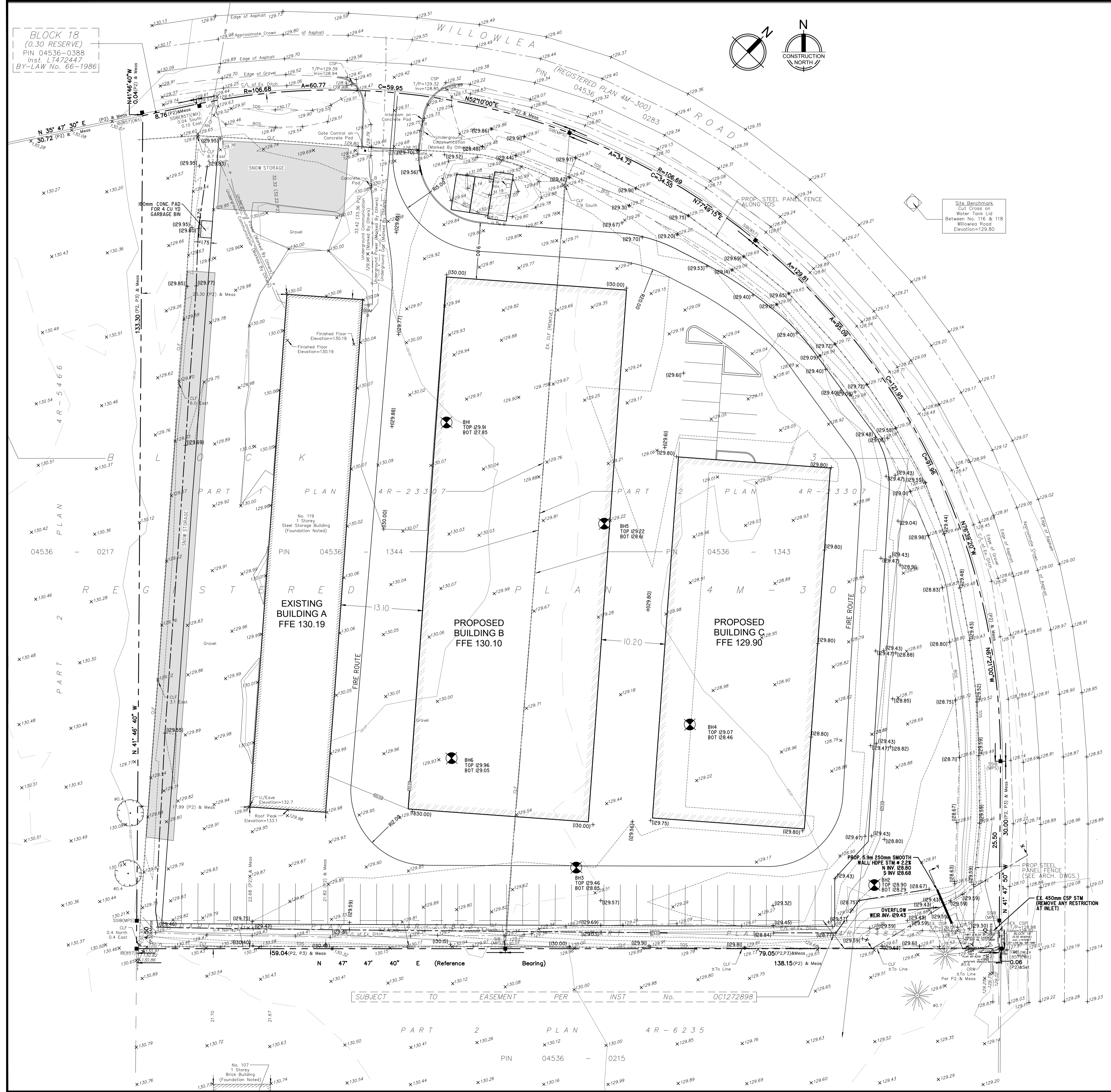
Therefore, minimum volume required for site: 140.29 m3
 Existing tanks: 90 m3
Balance required: 50.29 m3 or 50291 liters

(* Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches.)

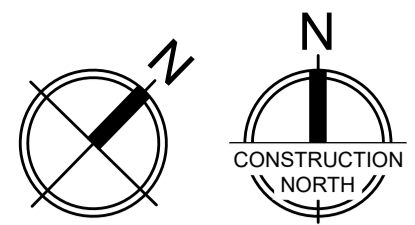
Summary: additional storage is to be provided to yield not less than 50.29m³ of additional fire suppression water storage, or as otherwise specified by the fire suppression consultants or mechanical engineers for this project.

APPENDIX C: SITE SERVICING AND GRADING PLANS

Provided for convenience and not for construction. Refer to full set of engineering drawings for construction purposes.



BLOCK 18
(0.30 RESERVE)
PIN 04536-0388
Inst. L747247
BY-LAW No. 66-1986



REVISIONS	
#	DATE
1	ISSUED FOR SITE PLAN APPROVAL
	3-DEC-21

LEGEND:

EXISTING	PROPOSED	
---	---	CURB
---	---	STORM SEWER
---	---	SANITARY SEWER
---	---	WATERMAIN
---	---	UTILITY
---	---	PROPERTY LINE
○ _{LS}	○ _{LS}	LIGHT STANDARD
○ _{HY}	○ _{HY}	HYDRANT
---	---	ELEVATION
---	---	SEWER OR WM TO BE REMOVED
---	---	HANDICAPPED PARKING (3.6m X 5.5m TYPICAL)
---	---	PAINTED PARKING LINE
○	○	DETECTOR CHECK VALVE
○	○	METER & BACKFLOW PREVENT.
---	---	OVERLAND FLOW ROUTE
---	---	AREA OF POTENTIAL PONDING IN CASE OF BLOCKAGE OF CB

CAUTION NOTE:
THESE DRAWINGS HAVE BEEN PREPARED FOR THE EXPRESSED AND SOLE USE OF THE OWNER, CONTRACTORS OR ANY OTHER THIRD PARTY. ASSUME FULL RESPONSIBILITY FOR THE ACCURACY, SUFFICIENCY, AND SUITABILITY OF PURPOSE OF ANY AND ALL INFORMATION CONTAINED HEREIN.
THIS DRAWING IS NOT TO BE SCALED.
CONSTRUCTION MUST CONFORM TO ALL APPLICABLE CODES AND REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.
ANY CONTRACTOR WORKING FROM DRAWINGS NOT SPECIFICALLY MARKED 'ISSUED FOR CONSTRUCTION' MUST ASSUME FULL RESPONSIBILITY AND BEAR ALL COSTS FOR ANY CORRECTIONS OR DAMAGES RESULTING FROM HIS WORK.

Designed By:

 M. J. Savodelli
 P. Eng.
 PROVINCE OF ONTARIO

Approved:

EC²E EDILESS CONSULTING CIVIL ENGINEERS
 185 Blake Avenue
 Willowdale, ON, M2M 1B5
 416-236-2341
 info@ec2e.ca

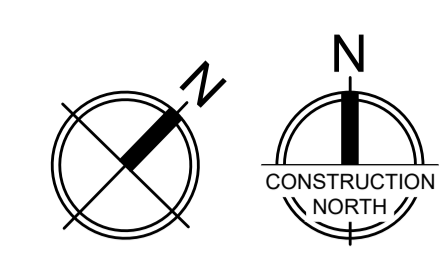
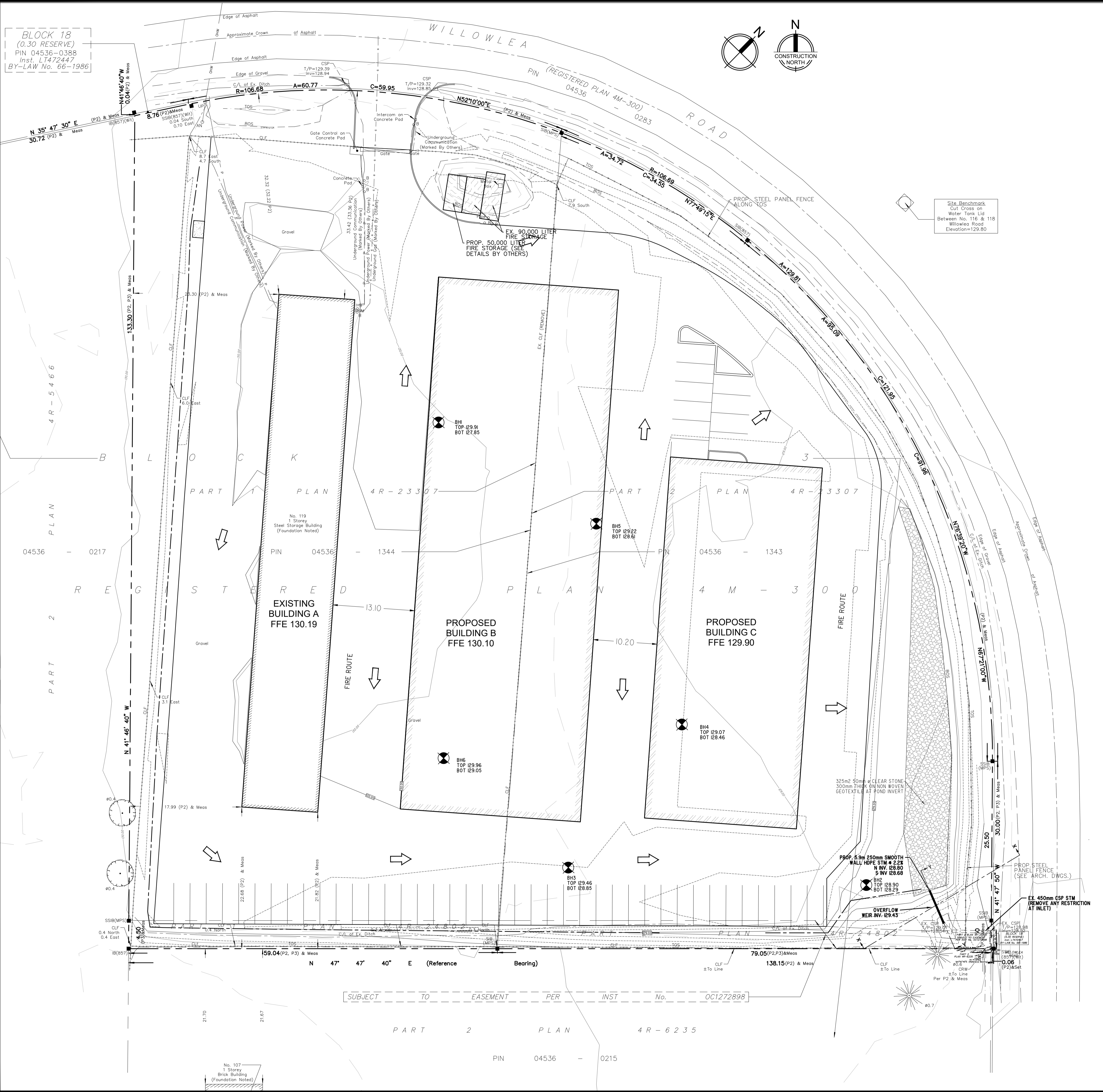
PROJECT

 ACCESS PROPERTY DEVELOPMENT
 ACCESS GROUP OF COMPANIES
 109-121 WILLOWLEA RD.
 CARP, ONTARIO
DRAWING
SITE GRADING PLAN

DATE	IDEC21	PROJECT NO.	2100
DRAWN	M.S.	DRAWING NO.	
CHECKED	C.C.		
SCALE	1:300		CS-101

NOTE:
THIS DRAWING TO BE READ IN CONJUNCTION WITH STANDARD DETAILS AND NOTES ON DRAWINGS CS100 AND CS-201 FOR THIS PROJECT

BLOCK 18
(0.30 RESERVE)
PIN 04536-0388
Inst. LT472447
BY-LAW No. 66-1986



REVISIONS

#	DATE
1	3-DEC-21
ISSUED FOR SITE PLAN APPROVAL	

LEGEND:

EXISTING	PROPOSED	DESCRIPTION
---	---	CURB
---	---	STORM SEWER
---	---	SANITARY SEWER
---	---	WATERMAIN
---	---	UTILITY
---	---	PROPERTY LINE
○ _{LS}	○ _{LS}	LIGHT STANDARD
○ _{HY}	○ _{HY}	HYDRANT
○ _E	○ _E	ELEVATION
---	---	SEWER OR WM TO BE REMOVED (3.6m X 5.5m TYPICAL)
---	---	HANDICAPPED PARKING (3.6m X 5.5m TYPICAL)
---	---	PAINTED PARKING LINE
---	---	DETECTOR CHECK VALVE
---	---	METER & BACKFLOW PREVENT.
---	---	OVERLAND FLOW ROUTE
---	---	AREA OF POTENTIAL PONDING IN CASE OF BLOCKAGE OF CB

CAUTION NOTE:

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Designed By:

Approved:

EC²E EDILESSÉ CONSULTING CIVIL ENGINEERS

185 Blake Avenue Willowdale, ON, M2M 1B5 416-236-2341 info@ec2e.ca

PROJECT
APD
ACCESS PROPERTY DEVELOPMENT
ACCESS GROUP OF COMPANIES
109-121 WILLOWLEA RD. CARP, ONTARIO

DRAWING
SITE SERVICING PLAN

DATE	1DEC21	PROJECT NO.	2100
DRAWN	M.S.	DRAWING NO.	
CHECKED	C.C.		
SCALE	1:300		CS-102

NOTE:
THIS DRAWING TO BE READ IN CONJUNCTION WITH STANDARD DETAILS AND NOTES ON DRAWINGS CS100 AND CS-201 FOR THIS PROJECT